

ART. XIX.—*New or Little-known Fossils in the National Museum. Part XXIX.—On some Tertiary Plant Remains from Narracan, South Gippsland.*

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(With Plates XII., XIII.)

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I.—Source and Nature of the Material.

The specimens herein described were obtained through the courtesy of Mr. H. J. Hauschildt, late of the Education Department, Victoria, who presented them to the National Museum Collection, 12/9/06.

The leaves occur in a fine-grained sandstone, which is whitish in places from the quantity of kaolin in the rock. This deposit evidently represents the waste from a former granite country. In a recent examination of this area, in conjunction with the Director of the Geological Survey of Victoria and Mr. F. A. Cudmore, the relations of the plant-bearing beds were made out as follows:—

They occur as a band of a few inches in thickness, forming part of a series of pebbly and sandy clays. These beds underlie the Older Basalt, and pass down into sands and clays often totalling 100 to 150 feet in places. These Tertiary detrital beds rest, in this area, on a denuded surface of Jurassic strata, though in some places in the neighbourhood, on Lower Palaeozoic.

The surfaces of the leaf-impressions are in most cases of a rust-colour to pink, but in some instances they approach to a rich madder-brown. The mineral staining has often strikingly brought out the venation of the leaves, thereby considerably aiding their comparison with similar forms from other localities.

These descriptions were practically finished for publication some years ago, but in view of the systematic work which the late Mr. Henry Deane had then undertaken for the Museum, the notes

were not then published. They were later submitted for perusal to Mr. Deane, who expressed his approval of the determinations.

## II.—Description of the Leaves.

### STERCULIACEAE.

Genus *Sterculia*, Linné, 1747.

*STERCULIA GIPPSLANDICA*, sp. nov.

(Plate XII., Fig. 1.)

*Sterculia* sp., Chapman, 1921, p. 118.

Description.—Leaf broad, trilobate, the side lobes bearing basal points; margin coarsely dentate. Petiole thick. Principal ribs rather strong, radiating from the base; two auxiliary veins emerging from the lateral veins at about  $45^\circ$  with the middle vein, and forming the principal veins of the basal lobes. Secondary veins emerging at an acute angle, the finer, at right angles.

Approximate Measurements.—Length from base to apex, 50 mm.; width, 80 mm.

Observations.—Ettingshausen described a somewhat similar form of leaf, based on an imperfect specimen, as *Acer subpro-ductum* (1888, p. 158, pl. xiv., figs. 2, 2a, 3), but the shape was more elongate than in the present form. The present species is preferably referred to the indigenous genus *Sterculia* rather than to the genus *Acer*, and this is also in agreement with Deane's conclusions on the Australian Tertiary fossil flora (1902, p. 15).

McCoy recorded a fossil leaf from the Tertiary ferruginous sandstone of Bacchus Marsh, which he says may be "possibly *Acer*," (1874, p. 24); but in all probability it is similar to the present form, at least generically.

*Sterculia gippslandica* evidently represents a broader type of leaf than Deane's *S. Muelleri* (1902, p. 5, pl. i., fig. 1), from the Pitfield Plains Bore.

*STERCULIA HAUSCHILDTI*, sp. nov.

(Plate XII., Fig. 2.)

Description.—Leaf broadly rounded, tending to become indented or palmate, but not so deeply incised as in *S. gippslandica*. Margin of leaf undulate and moderately indented at intervals. Midrib thick, divergent nearer the middle of the leaf than usual in the genus. Lateral veins dichotomizing once. Tertiary venation fine and reticulate.

Dimensions.—Leaf when complete about 65 mm. long by about 55 mm. broad.

## SAXIFRAGEAE.

Genus **Weinmannia**, Linné, 1759.(?) **WEINMANNIA** sp.

(Plate XII., Figs. 3, 4.)

Observations.—Two incomplete but large leaves, apparently of a long-ovate shape, are provisionally referred to the above genus, on account of a venation which is closely comparable with that of leaves of the type of *Weinmannia Biagiana*, Mueller. Mr. H. Deane had often discussed with me the same type of leaf found elsewhere, and had come to this conclusion regarding similar leaf-remains in the Bacchus Marsh series.

The principal rib is straight and rigid and the secondary veins are regularly spaced and divergent from the main rib at an angle of about  $25^{\circ}$ .

## MYRTACEAE.

Genus **Tristanites**, Deane, 1902.**TRISTANITES** *ANGUSTIFOLIA*, Deane.

(Plate XII., Fig. 5.)

*Tristanites angustifolia*, Deane, 1902, p. 23, pl. iii., fig. 1; pl. vi., fig. 7. Chapman, 1921, p. 118.

Observations.—Several leaves of this specific type occur in the Narracan sandstone. The more perfect examples accord in length and width with the measurements given by Mr. Deane, as recorded from Berwick.

Genus **Eucalyptus**, L'Heritier, 1788.**EUCALYPTUS** cf. **KITSONI**, Deane.

(Plate XIII., Fig. 6.)

*Eucalyptus Kitsoni*, Deane, 1902, p. 25, pl. iv., figs. 5, 6, 7. Chapman, 1921, p. 118, pl. viii., fig. 9. Maiden, 1922, p. 188, pl. ccxxiii., figs. 10a-c.

Observations.—Remains of several slender leaves occur in the Narracan sandstone. These agree in the main with the characters seen in the above species, both in outline and in the angle of venation of the secondary veins. The intra-marginal vein is also clearly seen. The longest leaf measures nearly three inches but the others are less. *E. Kitsoni* has been recorded from Berwick.

## MONOMIACEAE.

Genus *Hedycarya*, Forst., 1776.*HEDYCARYA* cf. *LATIFOLIA*, Deane.

(Plate XIII., Fig. 7.)

*Hedycarya latifolia*, Deane, 1902, p. 27, pl. vi., fig. 3. Chapman, 1921, p. 118.

Observations.—A nearly perfect leaf is found in the present collection, which compares fairly closely with Deane's figured type. The broadly ovate outline with serrated margin and finely reticulated area between the secondary veins are distinct features, all clearly seen in the present specimen. The slightly greater breadth of the leaf, which is circ. 65 mm. long by 60 mm. broad, is hardly of specific difference. Mr. Deane's original specimens occurred in the white clay at Wilson's Quarry, Berwick, overlain by older basalt and resting on a conglomeritic surface of Silurian.

Genus *Mollinedia*, Ruiz. and Pav., 1794.*MOLLINEDIA* cf. *MUELLERI*, Deane.

(Plate XIII., Fig. 8.)

*Mollinedia Muelleri*, Deane, 1902, p. 16, pl. i., fig. 4.

Observations.—This is here represented by a broadly ovate leaf with wavy and denticulate margin. The venation is typically that of *Mollinedia*, and although the specimen is imperfect, the outline compares closely with this broader species instituted by Deane.

## MOREAE.

Genus *Ficonium*, Ettingshausen, 1883.*FICONIUM* *SOLANDERI*, Ettingshausen.

(Plate XIII., Fig. 9.)

*Ficonium Solanderi*, Ettingshausen, 1888, p. 38, pl. iii., fig. 4.

Observations.—An almost perfect leaf-impression occurs with the specimens from Narracan. It is closely comparable, both in outline and venation, with the above species. The left margin of the leaf appears in the photograph to be irregularly denticulate, but this feature is fictitious, and is due to the overlapping margin where broken away; the lamina has an entire margin.

It is interesting to note that this fossil here occurs for the first time in Victoria. In New South Wales it is found at Dalton, near Gunning, in hard siliceous grit.

## LAURINEAE.

Genus *Cinnamomum*, (Tourn.) Linné, 1735.*CINNAMOMUM POLYMORPHOIDES*, McCoy.

(Plate XIII., Fig. 10.)

*Cinnamomum polymorphoides*, McCoy, 1876, p. 31, pl. xl., figs. 1-3. Ettingshausen, 1888, p. 125, pl. xi., figs. 3, 3a. Deane, 1902, p. 27, pl. i., figs. 6 and 12. Chapman, 1914, p. 90, fig. 61a. *Idem*, 1921, p. 118, pl. viii., fig. 6.

Observations.—Several well-preserved specimens occur here about the identity of which there can be no doubt. One of the leaf-impressions is remarkably distinct, and even the minutest veins are indicated. The principal veins are well shown, together with the tertiary veins of the intermediate area; these are very fine in contrast, and often arise at right angles from the stronger lateral veins and midrib. Another example represents the basal part of a leaf with a thick petiole. This fossil closely resembles Mr. Deane's figure (1902, pl. i., fig. 12), of *C. polymorphoides* from a bore at Pitfield Plains at 100 feet from the surface; the leaf-bed there occurs under two distinct layers of basalt, and is resting on basalt. The second of Mr. Deane's specimens he placed provisionally under this species, but there seems to be no doubt of the accuracy of his determination. Ettingshausen's *C. Leichhardtii* (1888, pp. 41 and 126, pl. iii., fig. 1; pl. xi., fig. 4), appears to be characterised by three strong veins of nearly equal thickness, and tertiary veins disposed almost at right angles to the midrib. The Victorian specimens seem to show every gradation between these two forms.

*Cinnamomum polymorphoides* has been previously recorded as follows:—In Victoria, from the Bacchus Marsh district, 2 miles W. of Maddingley, and half a mile N.W. of the junction of the Werribee River and Lyall's Creek; from the Cobungra, Bogong and Dargo High Plains in E. Gippsland, under the older basalt; and from a bore at Pitfield, Western Victoria, between basalt. In New South Wales it has been recognised by Ettingshausen in the hard siliceous grit resting on Silurian rock at Dalton, near Gunning, and at Vegetable Creek, in brown carbonaceous clay under basalt. The form *C. Leichhardtii* has also been found at Dalton, and at Newstead, near Elsmore, in concretionary ironstone associated with basalt.

## FAGACEAE.

Genus *Nothofagus*, Blume, 1850.*NOTHOFAGUS* cf. *MAIDENI*, Deane sp.

(Plate XIII., Fig. 11.)

*Fagus Maidenii*, Deane, 1902, p. 30, pl. vii., fig. 10. Chapman, 1921, p. 118, pl. viii., fig. 3.



Observations.—The present example is of the same length and proportions as the figured type, but being incomplete it is provisionally referred to this form. It is the under surface of the leaf that is exposed on the rock, showing a strong midrib. The lateral veins are not so clearly distinguishable, but are seen in part, as is also the dentated edge of the leaf. Deane's type came from the leaf-beds of Berwick.

### III.—Observations and Summary.

Although no leaves or other plant remains have been actually determined from Narracan, J. H. Wright (1894, p. 29) records the discovery of fossil leaves in the district. In speaking of this leaf-bed in quartzite beneath the Older Basalt at Ordlaw, he says :

“Interbedded with the dense rock appear occasional layers of indurated clay, containing abundance of leaf impressions. Weathered slabs of this hardened clay may be found, which on handling fall to pieces in thin and extremely brittle flakes, each lamination containing a more or less perfect impression of a leaf. I have obtained altogether from different localities where the quartzites occur eight distinct varieties of fossil leaves. Their classification, however, is still incomplete; but they appear to be of Miocene or possibly Eocene age.” Wright also mentions (*loc. cit.*) similar leaf-impressions in dark coloured sandstones at Dixon's Creek, in the same district.

From the descriptions of the Narracan plant-remains it will be seen that there occur here certain types of leaves which are found elsewhere, as at Bacchus Marsh, Dargo High Plains, the Cobungra, Bogong, Berwick and Pitfield. In addition to the specific forms recorded from these localities, it is possible, as previously indicated, that the *Acer* (?) sp. recorded by McCoy (1874, p. 24) from Bacchus Marsh, and later referred to by T. S. Hall and G. B. Pritchard (1894, p. 339), may be similar, if not identical with the leaf now described as *Sterculia gippslandica*.

The occurrence of *Ficonium Solanderi* in these beds, although hitherto restricted to New South Wales, is not surprising, since the probable stratigraphical identity of some of the Victorian and New South Wales plant-bearing beds has long been maintained (Wilkinson, 1882, p. 56).

In Victoria, one of the leaf beds above mentioned—that at Dargo High Plains—is found at a height of over 4000 feet above sea-level, whilst in New South Wales leaf-bearing deposits are found up to 5000 feet. This alone conclusively points to considerable elevation of the sub-coastal regions during and after Miocene times, for much of the sedimentary material with plant remains has been deposited in lakes, swamps and alluvial fans which could not have been far removed from the then existing coastal plain.

The relative abundance of *Cinnamomum* in these beds indicates a decidedly warm temperate climate at the time of deposition,

when the flora of Northern Australia, which had earlier invaded the south-eastern parts of the continent, has not been pushed back towards its original home.

Like the Tertiary leaf-bearing beds of Berwick and Dargo, the fossiliferous sandstone at Narracan is pre-Older Basaltic. On the other hand, the Bacchus Marsh leaf beds are post-Older Basaltic, and yet the flora presents a close similarity with the first-named. These apparently diverse relationships of the stratigraphy

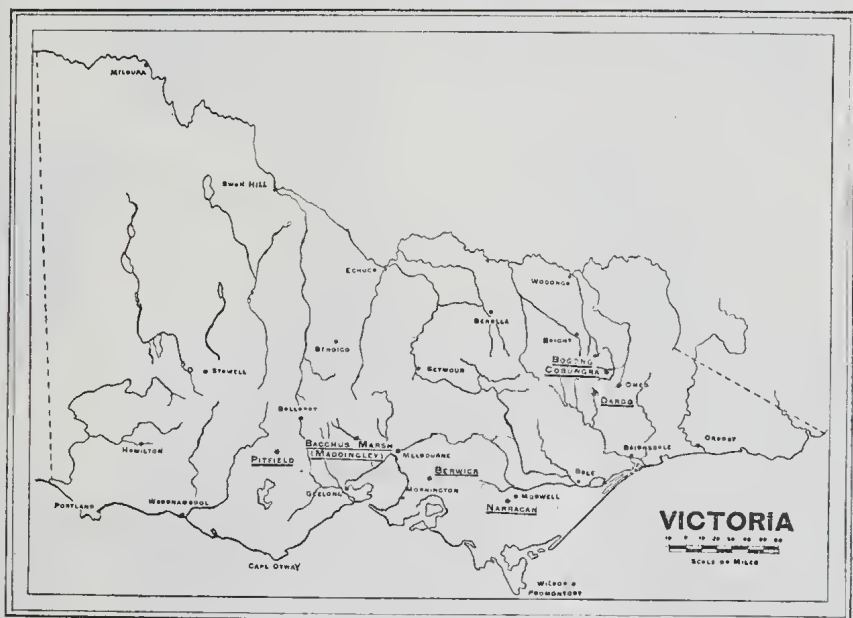


FIG. 1.—Sketch map of Victoria, showing localities mentioned.

would tend to confirm what has already been assumed, and is in reality to be seen in the field, that there were several flows of the Older Basalt. According to the present writer's conclusions, these older volcanic effusions most likely occurred during Miocene times, when great diastrophic movements were taking place.

## Synopsis of Distribution.

NAME.	VICTORIA.	N. S. WALES.
<i>Sterculia gippslandica</i> , sp. nov.	Narracan	
" <i>Hauschildti</i> , sp. nov.	?Bacchus Marsh	
? <i>Weinmannia</i> , sp.	Narracan	
	Narracan	
<i>Tristanites angustifolia</i> , Deane	Bacchus Marsh	
	Berwick	
<i>Eucalyptus Kilsoni</i> , Deane	Narracan	
	Berwick	
<i>Hedycarya latifolia</i> , Deane	?Narracan	
	Berwick	
<i>Mollinedia Muellcri</i> , Deane	Narracan	
	Pitfield	
<i>Ficonium Solanderi</i> , Ettingsh.	?Narracan	
<i>Cinnamomum polymorphoides</i> McCoy	Narracan	Dalton
	Bacchus Marsh	Dalton
	Pitfield	
	Cobungra	
	Bogong	
	Dargo	
<i>Nothofagus Maiden</i> , Deane sp.	Narracan	
	Berwick	
	?Narracan	

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